RMA/IND-EMCAT/DSM-D-01F

**Energy Management Consultation and Training Project:
Demand-Side Management Technical Assistance Component**

**Load and Market Research Strategy for Ahmedabad Electricity
Company**

June 1995

**Prepared by: Resource Management Associates of Madison,
Inc.**

**Prepared for :   United States Agency for International Development
(USAID)**

**New Delhi, India: Contract Number
386-0517-C-00-4100-00**

**and
Ahmedabad Electricity Company
Ahmedabad, India**

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**LOAD AND MARKET RESEARCH STRATEGY FOR
AHMEDABAD ELECTRICITY COMPANY**

1.0   Background

The Ahmedabad Electricity Company (AEC) is located in the state of Gujarat in India and is engaged in the generation, transmission, and distribution of electricity. In March 1994, AEC was identified as a site for a Demand-Side Management (DSM) Technical Assistance Program under the USAID-funded, three-year Energy Management Consultation and Training (EMCAT) Project. Resource Management Associates of Madison, Inc. (RMA) is the prime contractor for the EMCAT n Demand-Side Project, and the Industrial Development Bank of India is the lead Indian counterpart.

RMA is working with AEC to identify DSM potential and to initiate the development of a five-year DSM Action Plan. RMA is also providing technical assistance in designing, developing, and implementing a one-year DSM pilot program. Key to the successful development of DSM programs and marketing strategies is knowledge about customer loads and market characteristics. This information is needed in order to accurately predict the impact of AEC's DSM programs as well as to design and select programs appropriate for AEC and its customers. AEC is presently collecting a small amount of Load and Market Research Data, but more information is needed to design successful DSM programs. This document will establish a set of Load and Market Research objectives, explain the types of research which meet these objectives, and provide a set of recommended Load and Market Research activities (consistent with these objectives) for AEC to implement in the next few years. In addition, a detailed explanation of how specific types of Load and Market Research data are used to design a DSM program is provided in the attached appendix.

2.0 Process for Developing Load and Market Research Strategy

2.1 Identify Corporate Objectives and Define Research Objectives

AEC's overall corporate objectives are to provide reliable electric service to its customers at reasonable cost, and at the same time remain financially healthy (i.e., earn a reasonable rate of return). Although customer satisfaction is also very important to AEC, they assume that if service is reliable and costs are reasonable, customers will be satisfied.

The following research objectives and principles flow logically from these corporate objectives:

C   Research should be done whenever it is cost-effective for AEC. In other words, research should be done whenever the value of the information generated is greater than the cost to do the research.

C   Research should help AEC to minimize the cost of being wrong.

C   Research should help to improve the quality of decisions which are made at AEC.

C   Research should help AEC with forecasting and planning for the future.

C   Research should help AEC learn more about its customers and, in the process, improve its relationships with its customers.

AEC should use these objectives to guide its decisions on future research activities.

2.2 Develop Key DSM and Pricing Objectives

The key long-term DSM and pricing program objectives identified by AEC are as follows:

C   Programs should be designed to enable AEC to reduce power purchases from the Gujarat Electricity Board (GEB). Because AEC's purchases occur primarily during the late morning to early evening hours on weekdays throughout the year, programs should be designed to reduce customer usage during these hours.

C   Programs should be selected which flatten AEC=s load curve and increase its load factor. These can be accomplished in two ways:

1) By reducing customer demand during hours of peak usage

2) By shifting customer loads from peak to off-peak periods. In particular, AEC

would like to encourage the shifting of loads from daytime to nighttime hours. This can potentially benefit AEC by reducing its purchased power costs (during daytime hours) and by substituting lower-cost power produced at night by AEC=s own plants for higher-cost power purchased during the day from the GEB.

C   DSM programs should be cheaper than the cost of purchasing power from the GEB. (This is AEC=s benchmark for evaluating the cost effectiveness of its DSM programs.) In addition, DSM programs should be designed to target major customer sectors and end-uses, including those which are the fastest-growing and have the greatest coincidence with AEC's daily peaks.

AEC also identified other short-term DSM and pricing program objectives (mainly pertaining to the DSM pilot program):

C   The program should have a visible impact which can be achieved quickly

C   It should be relatively easy to implement

C   It should have a positive impact on the public and be generally popular with AEC's customers.

2.3   Review Current Research Efforts and Information Sources

AEC presently has the capability to produce the following types of Load and Market Research information:

C   *Load Research Data* BFor some time, AEC has had approximately 90 electronic meters (made by Secure) which it has been using for load research. AEC is able to use these meters to collect continuously-recorded demand data from its High-Tension (HT) industrial customers. This data can then be graphed as load profiles for various day types throughout the year. Software provided by Secure is used to generate the load profile graphs. Unfortunately, during RMA=s visit to AEC in June and July of 1004, AEC was having problems with this software and was able to provide load profiles for only 10 of the 88 metered customers.

C   *Survey Data* BThe results of a customer survey which was fielded in 1991 to a cross-section of 10,000B15,000 residential, commercial, and industrial customers by Span Associates are available. This study solicited customer opinions on the quality and reliability of electric service supplied by AEC and requested suggestions for improvements. Many of the recommendations in the survey have already been implemented by AEC.

C   *Historical sales and demand data (from billing records)* BHistorical sales and

demand data are tabulated by type of business or industry. Because the same types of businesses and industries use energy in the same or similar ways, it is very useful to have sales and demand data sorted by these categories for DSM program planning purposes. AEC had previously coded its commercial and industrial customers in order to be able to sort its billing data by type of business or industry. This coding was originally done as part of a study of energy theft, to enable AEC to better track historical sales trends over time and to detect any significant drops in usage within categories.

In addition, AEC is currently fielding an end-use equipment saturation survey to its High-Tension and Low-Tension (LT) industrial customers, with assistance from RMA and Span Associates. This survey was developed as part of the EMCAT project and will query customers in three main areas:

C   Descriptive statistics about the customer's business (facility size, number of employees, hours of operation, etc.)

C   Data on end-use equipment operated by the customer (type of equipment, size, quantity, rated capacity, hours of operation, etc.)

C   Criteria for purchasing energy-using equipment

While the survey is initially being administered to AEC's industrial customers, it is AEC's intention to eventually field this survey to statistically valid samples of its residential and commercial customers as well. AEC will then be able to generalize the survey results to its customer population as a whole. AEC also plans to re-administer this type of survey every few years to periodically update survey results.

2.4   Review Existing Customer Data

Besides the types of data and information described in the preceding section, AEC also has customer-specific data which may be of some value for DSM program planning and implementation. The following types of customer-specific data are available:

C   *Descriptive information* BWhen electric service is first provided to a customer, the customer is asked a number of questions about their facility, including the type of business, the size of their connected electric loads, etc. This type of information is available for all of AEC's customers, though it may be dated if the customer's business or residence has changed since the time of hookup.

C   *Billing data* BFor each customer, monthly or bimonthly billing data is available. The level of detail for this data is defined by the tariff schedule for the customer.

For instance, if the customer is on a demand-metered rate, demand data will be available. Energy data is available for most customers (except agricultural customers whose kWh consumption for pumping loads is estimated rather than metered).

C   *Load research and survey data* **B**For the studies previously mentioned (load research study, customer satisfaction study, end-use equipment study), customer-specific results are available for those customers who were included in the sample population.

2.5   Review Existing DSM and Pricing Programs

While AEC has no formal DSM programs in place at the present time, it does have several load control schemes which are informal load management programs. These load control protocols involve directing customers to shift or curtail operation during certain hours or days of the week on either a voluntary or mandatory basis. These schemes are described below:

C   Staggering of weekly holidays for LT and HT customers. The holidays are analogous to weekend days and are mandated at the Gujarat state level. They are different for various state regions and are determined by dividing the total load for the State evenly over seven days and then assigning each region specific days off. When days off are staggered in this manner, the overall load curve for the state is flattened, and its capacity needs are reduced. AEC's holidays are Sunday and Thursday. On Sundays, all HT, LT and most commercial loads are off. On Thursday, HT and LT load is off. This staggering allows AEC to reduce its purchases of capacity from the GEB by about 17 MW.

C   Mandatory industrial power cuts - state level. Power cuts for industry are announced by the GEB and coordinated by its load dispatch center. Power cuts are only for HT industrial consumers. Planned power cuts are introduced on a statewide level to assist with the maintenance of plants and/or unplanned outages. Power cuts are announced at 6:30 p.m. for the following day. AEC notifies its HT customers through an announcement in the local newspaper as well as with a phone call to each affected cusotmer. The cuts are limited by prior agreements with HT customers protecting their operation during certain shifts or certain times of the day. The power cuts are monitored at AEC by having a meter reader reset the customer's demand ratchet back to zero (before the power cut) and then read the meter after the power cut.

C   Evening Recess Staggering. In order to shave their evening peak, AEC has instituted a staggered load shedding procedure for HT and LT customers which coincides with their daily peak. The total period of peak shaving is two hours

(from 6:00 to 8:00 p.m. or 6:30 to 8:30 p.m.). The two-hour period is further divided into four half-hour segments. Then the HT and LT customers are divided into four groups. Each group is asked to shed load for a half-hour segment of the peak. Spot-checks are used to monitor compliance by customers.

2.6   Identify Key Data Needs and Where Gaps Exist

AEC should use the research objectives and principles contained in Section 2.1 to guide its data needs and research priorities. These objectives and principles provide a rationale for both the types of Load and Market research data which are collected and the urgency with which this data is collected.

In general, these objectives and principles support research (beyond what AEC is doing now) which is cost-effective and improves the quality of decision making. The following sections discuss AEC's Load and Market Research data needs in more detail.

3.0 Load Research

3.1 Load Research Data Needs

Load Research data provides information on the characteristics of various types of customer loads served by the utility. The type of Load Research data most commonly collected is continuously recorded demand data which can be plotted as typical daily load profiles for important customer groups. This data is collected by installing electronic meters on statistically valid samples of customers within each of the designated groups as AEC presently does with some of its High-Tension customers. Key customer groups are either those who currently contribute significantly to AEC's loads or those who are expected to contribute significantly in the near future.

This load profile data needs to be supplemented by survey data which provides descriptive information on sampled customers. This descriptive information includes data on thephysical size of the customer's home or business, the number of occupants or employees, the hours of occupancy or operation, and so on. This type of information enhances the interpretation of the load data which is also being collected. In addition, it allows the user to stratify the sampled customers further to study the characteristics of subgroups of interest, such as new homes or businesses.

AEC's key customer groups have been changing in recent years. Historically, large industrial customer loads have accounted for the majority of AEC's peak demands and kWh sales (through 1985, HT customers accounted for 70% of AEC's overall sales and revenue). However, the contribution of the HT group has been shrinking for the past several years due to a slump in the textile industry in the late 1980s and higher than average growth by AEC's residential and commercial sectors. Currently, HT customers' contribution to AEC's overall sales is about 40% and declining, while residential and commercial customers' contributions are 23% and 10%, respectively, and increasing. Thus, it is important to research all three customer types, as all will account for significant portions of AEC's electricity need in the near future.

There are a number of ways in which this load research data provides value to AEC. First, it can help AEC to design and evaluate DSM programs which are geared toward changing the customer's load shape. Second, it can help AEC to understand which types of customers and, specifically, what types of electric equipment are contributing to its peak loads and energy needs during certain times of the day or year. This type of information is useful for different types of activities, such as assigning cost responsibility to various types of customers so that cost-based prices can be set and designing DSM programs targeted at reducing customer loads during designated hours. Third, AEC can use this information to better understand the energy supply and cost implications of serving new types of loads which are contributing ever-increasing shares of AEC's overall peak demand and energy needs. Fourth, AEC can use this data as part of its DSM process to evaluate the magnitude of demand and energy savings achieved by measures installed for customers who are also part of the Load Research sample. This can be done by comparing the load profiles of such customers before and after installation of the energy efficiency

measures.

While only a small fraction of AEC's residential, commercial and small industrial customers will be included in the Load Research samples, nearly all of its large industrial customers will need to be in the sample (because such customers' loads vary greatly). This means that Load Research data can be used for nearly all of AEC's largest customers to evaluate the demand and energy savings of DSM projects undertaken. Since these customers are also likely to have the largest and most expensive projects, this is a valuable benefit of the Load Research data collected for these customers.

3.2   Recommended Load Research Strategy

AEC has the capability to collect continuously recorded demand data from 88 of its HT customers and generate their load profiles from this data, provided its software is working correctly. AEC needs to resolve the software-related problems and then continue to collect this data on a regular basis. Second, AED should expand this load research activity (as planned) to another 70 of its HT customers after the ABB and CG-Schlumberger meters are installed. Third, AEC needs to expand the number of customer groups sampled to include all major customer groups (residential, commercial, and municipal) and subgroups of interest, primarily those groups with rapid growth; and meter a statistically valid sample of customers within each of these groups. Fourth, AEC needs to collect the descriptive information previously described for all of its sampled customers.

4.0   Market Research

4.1   Market Research Data Needs

Market Research data provides insight into the general characteristics of different types of customers and customer markets served by the utility. More specifically, market research data gives information about the behavior of the end-use markets for energy-related services, and potential barriers to serving that market. Market Research data of interest to AEC encompasses the following types of information:

C   Data on the **physical characteristics** of customers and customer loads, such as the size of the customer's facility, the thermal integrity of the facility, the specific types and capacities of the end-use equipment operated by the customer, etc.

C   **Customer feedback** on specific products and services offered by the utility. This is typically gathered through customer satisfaction surveys and process evaluations of DSM programs.

C   A listing of the different **information sources** used by customers in various markets. Examples of these are newspaper stories or ads, television programs or ads or utility bill inserts, all of which can potentially be used to publicize (or "sell") utility products and services to customers in different markets.

C   **Customer preferences** for specific types of products or services in the marketplace, and specific marketing strategies. This information will influence the types of products or services developed by AEC as well as the marketing approach used to publicize the program or services.

C   **Customer attitudes** regarding specific issues faced by the utility (which can potentially affect the types of products and services offered and/or the methods used to market products and services). For example, customer concerns about frequent power outages may lead to AEC developing or marketing products (such as uninterrupted power supply equipment) to address these outages at the customer end-use level.

C   **General information** on the characteristics of the marketplace served by AEC. This includes information about barriers to specific markets. Barriers include such items as lack of equipment and lack of capital It is important for AEC to develop a thorough understanding of these barriers because, in some cases, they will be able to develop a product or service to address or eliminate the barriers.

AEC either has collected or is in the process of collecting the following types of Market Research information:

C   *Customer satisfaction information* BThe results of the 1991 survey described earlier are available. However, AEC has not re-administered this survey to determine whether customer opinions have changed or not. AEC also sponsors customer meetings a few times per year, at which customers are encouraged to comment on issues which they are concerned about.

C   *End-use equipment saturation information* BAs mentioned previously, AEC is in the process of designing and administering a survey to statistically valid samples of its residential, commercial, and industrial customers to obtain information on the types of end-use equipment operated by the customers, as well as descriptive information on the characteristics of the customers' homes or businesses, and their attitudes toward and awareness of energy efficiency.

4.2   Recommended Market Research Strategy

The customer satisfaction and end-use equipment surveys already implemented by AEC have provided very important market research information and should be re-administered at least every two years. In addition, the following types of market research activities are potentially of great value to AEC, and it should be pursued:

C   **Performing general research**. AEC needs to find out much more about its customers and its markets. Information which describes the present situation as well as the future is needed. The following are especially high priority research areas:

Customer demographics BGeneral trends in AEC's service area are needed by AEC to accurately forecast future loads and plan future DSM programs and strategies. More specifically, AEC needs the following types of information in order to reliably project the future: average incomes, family size, education level, population growth rate, employment, information about new businesses (number of employees, square footage, annual revenues), etc. Possible information sources include government agencies, such as the Gujarat Development Authority, and data from the Ahmedabad Chamber of Commerce.

Industry outlooks BBecause AEC's sales are so heavily dominated by a few large industries, information about the future of these industries or specific businesses within these industries (e.g., Arvind Mills) would provide AEC with data which is needed to project its future industrial and total loads. This information will help AEC with both DSM planning and overall corporate planning. AEC can gather this type of information from industry trade groups, such as ATIRA, and broader organizations such as the Confederation of Indian Industries (CII). The Ahmedabad Chamber of Commerce may

also be a helpful information source.

Planned new construction for residential and commercial buildings BBoth the residential and commercial sectors are growing rapidly, driving AEC's overall growth and worsening its load factor. AEC currently finds out about new construction in these sectors at the start of the construction process. If AEC can obtain data about these facilities earlier in the building cycle, it can do a better job of forecasting and planning for future growth, and designing DSM programs for these sectors. Local architects and financing institutions and the Chamber of Commerce can probably provide information on planned new construction for single-family homes, apartments, and important commercial categories, such as office buildings and hotels.

Energy-efficient equipment data BAEC needs to continue to expand and update the energy efficiency equipment data base which is presently being compiled. The purpose of this data base is to provide detailed up-to-date information on energy efficient equipment which is commercially available in India. This information includes equipment cost, energy savings, equipment life, reliability, and names and addresses of equipment distributors. This information is critical to AEC and its customers if DSM is to be successfully implemented at AEC. Potential information sources include energy-efficient equipment manufacturers, trade associations such as the CII, and research institutions such as TERI and EMC.

C   **Utilizing customer focus groups** to collect customer feedback on proposed DSM program concepts, advertising strategies, new products, etc. Focus groups are a relatively low-cost method of pre-testing proposed concepts on customers. Usually, a small group of customers is brought in to comment on the proposal. Customers are normally paid a small fee for their participation. The proposal is then revised in response to the feedback received from customers and the final program or advertising strategy is then implemented. Depending on how complex or costly the proposal is, it may be appropriate to have a few focus groups at different stages of program development.

The following figure shows a schedule for implementing the recommended activities during the next five years. (This five-year time frame is intended to correspond to the time period covered by the five-year DSM Action Plan.) This schedule assumes these activities will begin to be implemented in the second quarter of 1995.

TIME LINE FOR IMPLEMENTING LOAD AND MARKET RESEARCH STRATEGY